IMPACT OF MICROFINANCE IN AGRICULTURE AND LIVESTOCK PRODUCTION; INSIGHTS FROM CENTRAL NEPAL

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ABSTRACT

This paper examines the impact of microfinance in agriculture and livestock in Dhading and Chitwan districts of Nepal. Municipalities within the districts were selected purposefully, and 60 respondents from each district were selected by simple random sampling method to comprise 120 respondents. The study showed significantly higher percentage of people participating in microfinance had self-sufficient food production. Probit regression analysis was done to estimate the impact of different predictor variables on farmer's participation in microfinance. Although the production, income and gross margin of rice and wheat and gross margin of livestock was found statistically higher among the farmers participating in microfinance, the expense for rice and wheat was also found significantly higher among the farmers participating in microfinance. The result of Probit regression analysis showed six variables namely age of household head, caste/ethnicity, education of household head, agricultural credit, livestock unit (LSU), and annual household income were statistically significant for farmer's participation in microfinance.

Keywords: Agriculture, livestock holding, microfinance, productivity, self-sufficiency

INTRODUCTION

The estimated population of Nepal is around 28.61 million and 17.4 percent of them are with the incidence of multidimensional poverty (NPC, 2019). Agriculture, including crop, livestock and fisheries, is a prime source of livelihood of Nepalese people and contributes 25.8 percent to national Gross Domestic Product (MOF, 2021). Agriculture in Nepal is characterized by large number of small and marginal farms with limited financial resources and hence they cannot apply optimal inputs and new production technologies for higher production. Many programs have been implemented for food security and improving crop production in Nepal. Among those microfinance programs are seen as poor targeted and rural based. Hence, various development strategies aimed at alleviating poverty are now invariably incorporating micro-finance as one of the key sectors in their programs.

Microfinance is defined as a sector of formal and non-formal financial institutions providing micro-savings, micro-credit, and micro-insurance services to the micro-

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economy thereby allocating scarce resources to the micro-investments (Seibel & K.C., 1998). Micro-credit normally means a credit of less than NRs. 30,000 and given without collateral and less paper-work (Paul, 2006). Microfinance is not simply banking for the poor; it is development approach with a social mission (Hansen & August, 2009) through catering the financial needs of economically active poor marginalized from the formal financial sector, be it for socio-cultural, systemic, geographic, or other reasons.

The introduction of Small Farmers Development Program (SFDP) by the government owned Agricultural Development Bank of Nepal (ADB/N) in 1975 marks the formal beginning of history of microfinance in Nepal. The program began after a multi-agency and multi-disciplinary field workshop of Food and Agriculture Organization/Asian survey on Agrarian and Rural Development (FAO/ASARD) in a number of countries including Nepal(Acharya S. , 2001). A pilot project in Sakhuwa Mahendranagar of Dhanusha district and Tupche of Nuwakot district was implemented with a broad humanistic goal of facilitating to achieve minimum desirable quality of life to the marginalized small farmers. It came into operation in the form of a pilot sub-project office (SPO) (Pyakuryal , 1997).

Micro-finance has been a particularly effective development intervention for the three basic reasons (Hansen & August, 2009); the service provided can be targeted specifically to the poor and the poorest of the poor; these services can make significant contribution to the socio-economic status of the targeted communities; and the institutions that can deliver these services can develop, within a few years, into sustainable organizations. It has, therefore, become necessary to study the impact of microfinance on efficiency performance of farms and agricultural production. The research is designed to conduct a thorough study to assess the impact of microfinance on farm performance, agricultural production and food security.

Nepal faces considerable development problems and challenges. Agricultural productivity is low and declining due to population pressure on marginal as well as agricultural lands. Nepal's limited resource, rapid population growth (1.35 percent per annum)(CBS, 2015), low land-man holding capacity (0.68 ha per capita), environmental degradation and widespread poverty are the challenges for the development. Around 85 percent people live in rural areas and have very limited opportunities to financial resources. The access to the financial services for the rural peoples is further hindered by the geographical limitations. It is estimated that 80 percent of total population in Nepal have no access to formal credit (Paul, 2006). As a result, informal financial institutions still dominate in most of rural areas. Even in places where facilities of credit exist, poorer households lacking collateral-suitable assets are considered risky borrowers (Sharma, 2004) and excluded because of the

strict collateral requirements and high transaction cost involved (Zeller & Sharma, 2000). Thus it is essential to make cheap credit available to the rural areas. The general objective of this study was to access the impact of microfinance on crop and livestock production.

METHODOLOGY

STUDY POPULATION, SAMPLE SIZE, SAMPLING TECHNIQUE AND METHOD OF DATA COLLECTION

The study was carried out in Dhading and Chitwan districts. The research sites, Nilakantha Municipality and Bharatpur metropolitan city were selected purposefully to include peoples from different geographical locations. A total of 120 farming households,60 from each municipality, were selected as study sample. Simple random sampling method was adopted to select the sample from the population. To make a comparative study, with and without approach for microfinance was adopted. Interview schedule was prepared to collect primary information from the selected farmers.

METHODS AND TECHNIQUES OF DATA ANALYSIS

The collected information was coded, entered and edited with the help of Microsoft excel and analysis was done with the help of STATA (Version 14.2).Both primary and secondary data was analyzed using mean difference test, independent t-test and probit test.

With and without approach

This approach compares the conditions of households who have participated in the microfinance programs and those who haven't. The crop and livestock production and productivity of the household participated in microfinance program is compared to that of the households which haven't participated in the microfinance.

Probit regression model

Probit regression model is a statistical model which aims to establish a relation between probability values and explanatory variables and to ensure that the probability value remains between 0 and 1(Gujrati, Econometrics by example, 2015).In the Probit model, suppose Y_i be the binary response of the farmers and take only two possible values; Y = 1, farmer with microfinance and Y = 0, farmer without microfinance. Suppose X be the vector of several explanatory variables affecting to the farmers participating in microfinance andβ, a vector of slope parameters, which measures the changes in X on the probability of the farmers with and without

participation in microfinance programs. The probability of binary response was defined as follows:

If Yi = 1; Pr ($Y_i = 1$) = P_i
$Y_i = 0$; Pr ($Y_i = 0$) = 1-P_i

Where,
P_i = E (Y = 1/x) represents the conditional mean of *Y* given certain values of *X*.
There were several factors that affect the farmer's participation in microfinance. Decision to adopt at higher level might be influenced by several socioeconomic, institutional and financial conditions of the responding farmer. The aim of the model is to predict the influence of variables (*X*) on the probability of participating in microfinance (*Y*, dependent variables). According to this, in the probit model the likelihood of farmers to participate in microfinance is a non-linear function of variables.

Pr(Y=1) = (*X* beta)
Probit model was used to quantify the probability of different factors to participate in microfinance programs.

MODEL SPECIFICATION

The probit model specified in this study to analyze farmer's participation in microfinance was expressed as follows:

$$Pr(Y=1) = f(b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12})$$

Where,
Pr (Y=1) = Probability score of participating in microfinance
X_1= Districts
X_2= Age of household head (years)
X_3= Gender of household head
X_4= Ethnicity of household head
X_5= Education of household head
X_6= Occupation of household head
X_7= House type
X_8= Land holding
X_9= Credit
X_{10}= LSU
X_{11}= Annual income of household
$b_1, b_2 \ldots b_{11}$= Probit coefficient

RESULTS AND DISCUSSIONS

DISTRIBUTION AND SIZE OF LAND HOLDING

The average land holding was found similar in Dhading and Chitwan district (0.36 ha in an average) (Table 1). The average lowland holding of both study area (0.30 ha on average) was significantly higher than upland holding (0.06 ha on an average).

Table 1. Land holding pattern of the sample households by respondent category

	Average land holding (ha) per household		
Districts	Lowland	Upland	Total land
Dhading	0.26	0.10	0.36
Chitwan	0.34	0.02	0.36
Average	0.30	0.06	0.36

LIVESTOCK HOLDING

The average of livestock ownership was calculated in Livestock Standard Unit (LSU) to aggregate different types of livestock owned by respondent per household (Table 2). Aggregate LSU is calculated as(Adhikari J. , 2000):LSU= 1 (cow/bull) + 1.5 (buffalo) + 0.4 (goat/sheep) + 0.6 (swine/Pig) + 0.02 (poultry). As indicated in Table 2 average LSU for sample area in Dhading district was significantly higher (11.40) then that for Chitwan district (3.33).

Table 2. Livestock unit (LSU) in study area

Districts	Average LSU
Dhading	11.4058
Chitwan	3.3325
Total average	7.3692

FARMERS PARTICIPATION IN MICROFINANCE

Out of 120 households surveyed 78 households have participated in microfinance and 42 households have not participated in microfinance. The further details of farmer's participation in microfinance in both districts is given in the figure 1.

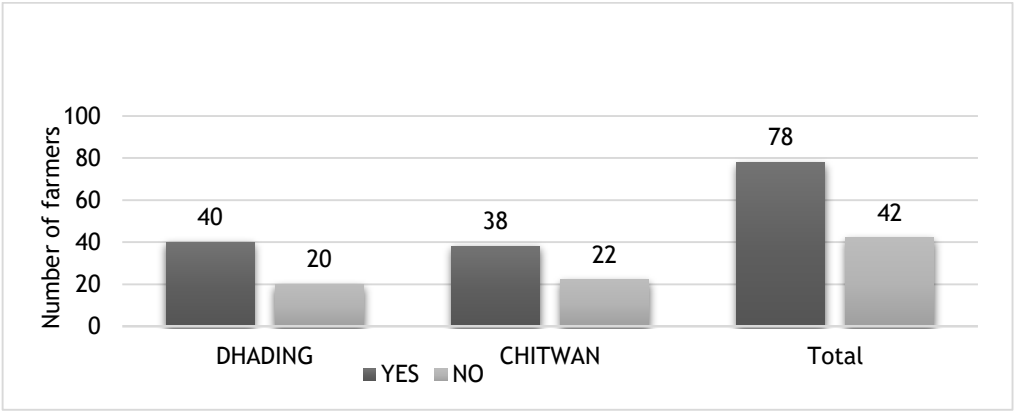

Figure 1. Farmers' participation in microfinance

FOOD SELF-SUFFICIENCY AND MICROFINANCE

A comparison was made between people's involvement in microfinance and food self-sufficiency as shown in Fig. 2 and Fig. 3. It showed that people who are involved in microfinance have higher food self-sufficiency (65 percent) than the people who are not involved in microfinance (62 percent). Also it was seen that 5 percent farmers without microfinance have food sufficient for less than 3 months.

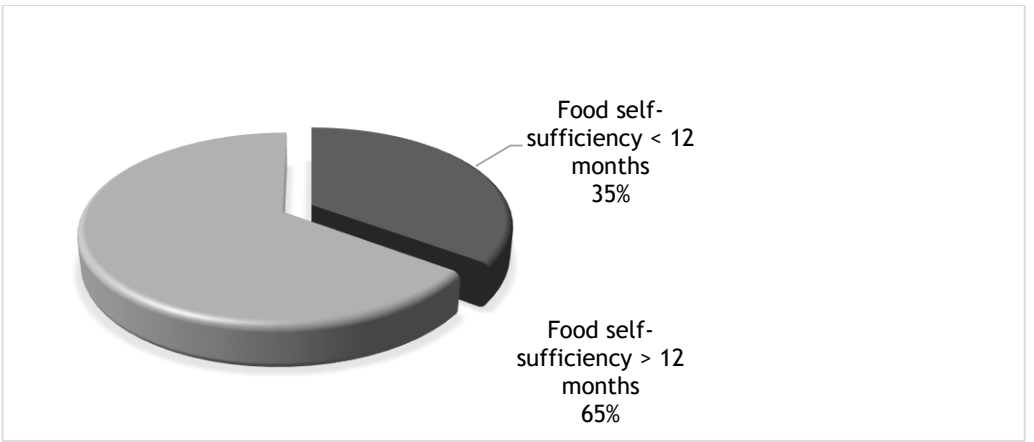

Figure 2. Food self-sufficiency with microfinance

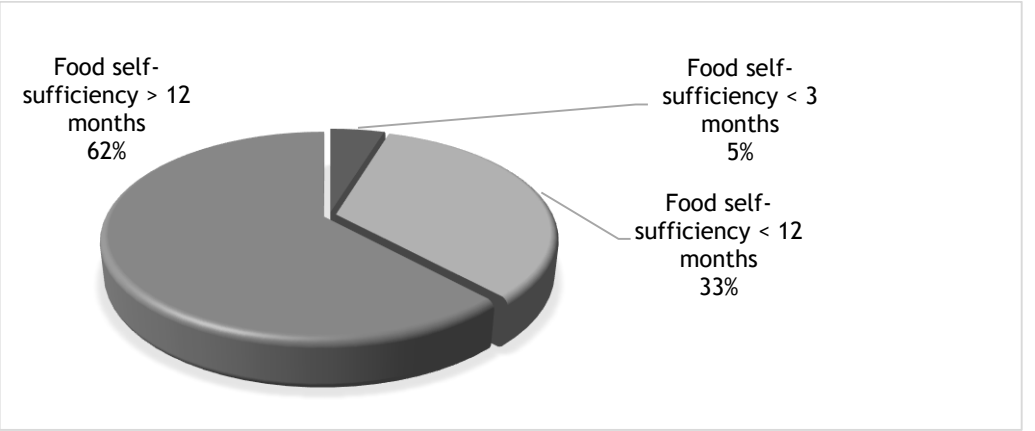

Figure 3. Food self-sufficiency without microfinance

IMPACT OF MICROFINANCE ON CROP AND LIVESTOCK PRODUCTION

Among the crops, rice and wheat production were significantly different with microfinance and without microfinance (Table 3). The overall average rice production in the study area was2.20 Mt. 22.07 with 2.71 Mt. produced by farmers participating in microfinance and 1.55 Mt. produced by farmers not participating in microfinance which is statistically significant difference (P value =0.000). Similarly, average wheat production of the study area was 0.31Mt.with 0.40 Mt. produced by farmers participating in microfinance and 0.26 Mt. produced by farmers not participating in microfinance which was also significant at 1 percent level. (Sulemann & Adjei, 2015), also found that microfinance was positively correlated with production of rice with correlation coefficient 0.798 which is considered high. The average milk production per household per year was found to be around 6122 liters, which was statistically similar among microfinance participants and non-participants.

Table 3. Production from crops and livestock with farmer's participation in microfinance

Variables	Overall (N=120)	With Microfinance (n=78)	Without Microfinance (n=42)	Mean difference	T-Value	P-Value
Rice Production (Mt.)	-2.20	2.71	1.55	1.15***	5.319	0.000
Maize Production (Mt.)	0.03	0.03	0.03	0.00	0.543	0.588
Wheat Production (Mt.)	0.31	0.40	0.26	0.13***	2.602	0.010
Milk Production (Mt.)	6121.78	934.76	9150.25	-8215.48	-1.117	0.266

Note: *** indicates significance at 1 percent level.

IMPACT OF MICROFINANCE ON CROP AND LIVESTOCK INCOME

There was significant difference in the income from rice and wheat at 1 percent level among the farmers with microfinance and without microfinance (Table 4). Similar difference in income from agricultural crops was also found by(Girabi & Mwkaje, 2013) between peoples participating in microfinance and not participating in microfinance. The income form the maize and livestock was statistically similar.

Table 4. Income (in NRs) from crops and livestock with farmer's participation in microfinance

Variables	Overall (N=120)	With Microfinance (n=78)	Without Microfinance (n=42)	Mean difference	T-Value	P-Value
Income from Rice	84817	139722	55252	84470***	4.133	0.000
Income from Maize	22324	24407	21202	3204	0.710	0.479
Income from Wheat	9069	11621	7694	3926***	2.649	0.009
Income from Milk Production	113606	128482	105596	22885	0.591	0.556

Note: *** indicates significant at 1 percent level.

IMPACT OF MICROFINANCE ON CROP AND LIVESTOCK EXPENSE

The independent t-test showed that there was significant difference among the people with microfinance and without microfinance with respect to expense for rice at 1 percent level and wheat at 5 percent level respectively (Table 5), whereas the expense for maize and livestock was not statistically significant.

Table 5. Expense (in NRs.) for crops and livestock with farmer's participation in microfinance

Variables	Overall (N=120)	With Microfinance (n=78)	Without Microfinance (n=42)	Mean difference	T-Value	P-Value
Expense for Rice	24435	39976	16065	23911***	4.961	0.001
Expense for Maize	10501	8769	11433	-2664	-1.121	0.264
Expense for Wheat	4573	5906	3854	2052**	2.352	0.042
Expense for Livestock	19149	18653	19416	-762	-0.099	0.921

Note: ** and *** indicates significant at 5 percent and 1 percent level respectively.

IMPACT OF MICROFINANCE ON CROP AND LIVESTOCK GROSS MARGIN

The gross margin analysis of selected crops and livestock enterprises among the farmers with and without microfinance participation revealed significantly higher

gross margin of rice, wheat and livestock among the microfinance participating farmers while the gross margin of maize was insignificantly higher among the microfinance participants (Table 6). Significant relationship between microfinance and crop production was also found by (Eliasu, Al-Hassan, Rose, & Mohammed, 2014), where farmers in microfinance increased crop production by one third. An 39.13 percent increase in adult buffalo population due to credit form microfinance was found by (Taj, Bashir, Shahid, & Shah, 2012), the same research showed more than 81 percent increase in buffalo young stock and 100 percent in goat population after micro-credit utilization, which could lead to higher gross margin from livestock.

Table 6. Gross Margin (in NRs.) from crops and livestock with farmer's participation in microfinance

Variables	Overall (N=120)	With Microfinance (n=78)	Without Microfinance (n=42)	Mean difference	T-Value	P-Value
Gross Margin of Rice	69326	133161	34953	98208***	3.875	.000
Gross Margin of Maize	13197	14360	12571	1789	0.284	.777
Gross Margin of Wheat	4503	7597	2837	4760***	3.054	.003
Gross Margin of Livestock	95136	194222	41782	152440***	3.883	.000

Note: *** indicates significant at 1 percent level.

FACTORS AFFECTING FARMER'S PARTICIPATION ON MICROFINANCE IN STUDY AREA

To identify the factor influencing the participation of microfinance, probit model of regression was used. Farmers in the study area were found engaged in microfinance based on various factors. The farmer's participation in microfinance in the study area was categorized into binary response of their engagement =1 and 0 otherwise.

Table 7. Summary of the variables used in probit regression

Variables	Description	Obs	Mean	Standard deviation	Min.	Max.
Dependent variable MICROFINANCE	Participating in microfinance programs. (1= with microfinance, 0= without microfinance)	120	0.65	0.47	0	1
Independent variables						
DISTRICT#	District of the respondent (1=Dhading, 0= Chitwan)	120	0.5	0.50	0	1
AGE_HH	Age of the household head	120	51.75	12.37	27	85

	(in years)					
GENDER_HH#	Gender of the HH (1= Male, 0= female)	120	0.92	0.26	0	1
ETHNICITY#	Caste of HH (1= Brahmin/Chhetri, 0= otherwise)	120	0.62	0.48	0	1
EDUCATION_HH#	Education of the HH (1= literate, 0= illiterate)	120	0.75	0.43	0	1
OCCUPATION_HH	Occupation of HH (1= Agriculture, 0= otherwise)	120	0.78	0.41	0	1
HOUSE_TYPE#	Type of house (1=Pakki, 0=Kachhi)	120	0.20	0.40	0	1
LAND_HOLDING	Total size of cultivated land (in hectares)	120	0.37	0.32	0	2.1
CREDIT#	Credit from microfinance for agriculture/livestock	120	0.46	0.50	0	1
LSU	Livestock standard unit	120	54.13	386.06	0	3006
LOG_INCOME	Total Farm income (Rupees/ha)	120	12.02	0.75	10	14.3

Marginal change in probability (marginal effects after Probit) was evaluated at the sample means. Probit regression analysis was focused on the 120 respondents of the study area with or without participating on the microfinance. The wald test (LR chi^2) for the model indicated that, the model had good explanatory power at the 1% level. The Pseudo R^2 was 0.634. For the interpretation of the model, marginal effects were driven from the regression coefficients, calculated from partial derivatives as a marginal probability as shown in Table 8.

Probit regression analysis showed that, six out of eleven variables were statistically significant for farmer's participation in microfinance, they were age of household, caste, education of household, credit, livestock standard unit and income of the household. Five other variables namely district, gender of household head, occupation of the household head, house type and land holding were statistically non-significant.

Higher the age of the household head, lower will be the participation in microfinance. The study revealed that, the age of the household head was negatively significant at 1 percent level and keeping other variables constant, a unit increase in age of household head would reduce the probability of participating in microfinance by 1.5%. This might be due to the increased dependency on higher age of household heads (Ayamga, Sarpong, & Brempong, 2006) also found the similar findings.

Similarly, farmer's participation in microfinance was negatively significant with ethnicity at 10 percent level. On moving from Brahmin/Chhetri to Janajati and Dalits,

the farmer's participation on microfinance would be decreased by 3.5% keeping other variables constant. Farmer's participation on microfinance was also negatively significant with education of household head at 10 percent level. When the household head becomes literate the probability of participating in microfinance would reduce by 6.3%. The results are consistent with (Karanja & Mwaura, 2016) who found that when women's level of education is lower the probability of joining microfinance was higher. Farmer's participation on microfinance was positively significant with credit taking for agriculture at 1 percent level. When a household takes credit the probability of participation in microfinance would increase by 47%.

Farmers participation in microfinance was also negatively significant with livestock unit at 5 percent level. It means a unit increase in livestock unit will decrease the farmer's participation in microfinance by 0.02%. The reason for this may be that the people with higher livestock unit will have income round the year and they need microfinance organizations less than others. Farmers participation in microfinance was positively significant with household income at 5 percent level. With an increase in household income, the probability of participating in microfinance would increase by 2%. This can be related that farmers with higher income participate microfinance for saving purposes. However, this contradicts the findings from (Nxumalo & Olaele, 2013).

Table 8. Factors affecting people's participation on microfinance in the study area

Variables	Coefficient	Standard error	Z	P>|Z|	dy/dx
District	-0.541	0.472	-0.96	0.339	-0.015
Age hh	-0.059***	0.018	-3.12	0.002	-0.001
Gender hh	0.694	0.773	0.90	0.369	0.012
Caste	-0.800*	0.428	-1.87	0.062	-0.035
Education hh	-1.020*	0.532	-1.92	0.055	-0.063
Occupation hh	-0.308	0.570	-0.54	0.589	-0.012
House type	-0.781	0.512	-1.53	0.127	-0.165
Land holding	-0.467	0.576	-0.81	0.417	-0.150
Credit	4.068***	1.204	3.38	0.001	0.470
Lsu	-0.752**	0.031	-2.41	0.016	-0.002
Log income	0.632**	0.265	2.38	0.017	0.020
# dy/dx is for discrete change of dummy variable from 0 to 1.					
Summary statistics					
Number of Obs.	120				
LR $chi^2(11)$	98.26				
Prob> chi^2	0.000				
Pseudo R^2	0.6324				

CONCLUSIONS

Microfinance can potentially reduce vulnerability by helping rural people by diversifying their source of household income, increase their savings, expand their options for credit, improve household money arrangement and thus increase the farm productivity by increasing the access to agricultural inputs. In the study, higher percentage of people participating in microfinance was found to have self-sufficient food production. The participation in microfinance was found to have improved the production and gross margin of rice and wheat. Similarly, it has improved the gross margin from livestock too. Probit regression analysis showed that, six variables were statistically significant for farmer's participation in microfinance, they were; age of household head, ethnicity, education of household head, agricultural credit, LSU and annual household income. Among them age of household head, caste, education of household head, and LSU had significant negative impact and agricultural credit and annual household income had significant positive impact on farmer's participation in microfinance. Thus, effective monitoring and evaluation of the microfinance programs along with frequent follow ups would be recommended to ensure appropriate utilization of microfinance credits.

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